

WiLink[™] WLAN IP Real-Time Tuning Tool (RTTT)

This user's guide describes the TI RTTT software application that operates, tests, debugs, and calibrates the Wi-Fi® IP during development of WL127x, WL128x, and WL18xx TI wireless connectivity chipsets. This guide describes the RTTT modes of operation, connection and firmware download steps, and how to use the graphical user interface (GUI) to transmit, receive, and manipulate WLAN packets.

Contents

1	Requir	ements	3
	1.1	System Requirements	3
	1.2	Configuration Requirements	3
2	Installa	ation	4
3	Modes	of Operation	4
	3.1	Serial Port Mode	5
	3.2	USB Over Android Debug Bridge (ADB) Mode	5
	3.3	Operational Mode	6
4	Conne	ction and Firmware Download	6
	4.1	Register Reads and Writes	8
	4.2	Power Mode Menu	8
	4.3	Antenna Mode Menu	9
5	TX Ta	b	11
	5.1	TX Packets Section	11
	5.2	TX Tab Overall Output Power Area	12
	5.3	TX Tab Tones Area	12
	5.4	TX Duty Cycle Configuration	13
	5.5	Output Power Test on the WiLink 8 Device	14
6	RX Ta	b	15
	6.1	RX Statistics Area	15
	6.2	Sensitivity Measurements	15
Appendix A Terms and Abbreviations		Terms and Abbreviations	17

List of Figures

1	RTTT Icon	4
2	RT^3 Main Working Window	4
3	Settings Area With Serial Port Selected	5
4	Settings Area With USB Over ADB Mode Selected	5
5	Settings Area With Operational Mode Selected	6
6	RT^3 Main Working Window After Connection and Firmware Download	6
7	Selecting the Firmware Files to Download	7
8	Downloading Firmware Message	7
9	Packet Types for Channel 7	8
10	Read and Write Registers	8
11	Power Mode Menu	9
12	Antenna Mode Area of the RT^3 Window	9
13	TI Module WL1837 Block Diagram	10
14	TX Tab Display	11



12
12
13
14
15
16

List of Tables

1	Antenna Mode Supported Configuration	9
2	TX Parameters	11
3	20-MHz BW Rates	13
4	20-MHz and 40-MHz BW Rates	13
5	Terms and Abbreviations	17



1 Requirements

1.1 System Requirements

The RTTT requires the following hardware and software:

- PC running Pentium[®] II (minimum requirements)
- Operating systems: Windows[®] 2000, Windows XP, Windows 7
- Serial communication port (RS-232) or USB port with UART-to-USB adapter (to enable the RS232 interface on the WiLink 8.0 IC, see the *WL18xx Hardware Integration Users Guide* [SWRU437])
- For WLAN TX validation, standard RF equipment (such as a power meter, spectrum analyzer, vector signal analyzer, or a combined tester such as Litepoint[™] IQxeI[™]) for TX output power, WLAN mask, and EVM measurements.
- For WLAN RX validation, a vector signal generator to generate WLAN packets for the IC to analyze.

Debug and calibration tools for WLAN and *Bluetooth*[®] require four UART ports. The most efficient way to drive these ports to the PC is to use a UART-to-USB converter (not included in the wireless tools package). TI recommends using the <u>WL18XXCOM82SDMMC</u> adapter with the TI <u>WL1837MODCOM8I</u> module or <u>WL1835MODCOM8B</u> module on the COM8 board.

NOTE: Multiple UART-to-USB adapters are available on the market, such as the <u>FTDI Chip™</u> development modules.

1.2 Configuration Requirements

The RTTT application for the <u>WiLink 8 WLAN NLCP package release</u> requires the latest versions of the following configuration files:

- WiLink 8 WLAN firmware
- WiLink 8 WLAN .ini files
- WL128x firmware:
 - wl128x-fw-4-mr.bin
 - wl128x-fw-4-sr.bin
 - wl128x-fw-4-plt.bin
 - WL128x INI files
- WL127x firmware:
 - wl127x-fw-4-mr.bin
 - wl127x-fw-4-sr.bin
 - wl127x-fw-4-plt.bin
 - WL127x INI files

The installation files are located in the directory named *Wireless Tools* at the installation path configured during installation. By default, the files are located at the following path:

C:\Program Files (x86)\Texas Instruments\Wireless Tools

NOTE: Throughout this document, the directory in which the installation files reside is referred to as the *Installation directory*.



Installation

2 Installation

The RTTT application is part of the TI wireless tools package release. When the wireless tools package is installed, the RTTT icon is created in the Texas Instrument\Wireless Tools folder at Start \rightarrow Programs and on the desktop (see Figure 1).



Figure 1. RTTT Icon

To start the RTTT application, double-click the RTTT icon. The software initializes and displays the RT^3 main working window (see Figure 2).



Figure 2. RT^3 Main Working Window

3 Modes of Operation

The RTTT includes the following modes of operation:

Serial port

4

- USB over Android[®] debug bridge (ADB)
- Operational mode

The modes are selected in the Settings area on the Connection tab of the main working window.



3.1 Serial Port Mode

The serial port mode provides a direct PC connection of the WLAN IP through the RS-232 interface, typically using a UART-to-USB bridge. This mode allows firmware download and full operation of the Wi-Fi IP in TX and RX modes. The serial port mode is also the default debug option on the Windows platform used to operate the device in Wi-Fi TX and RX mode, carrier wave (CW), and using the read/write registers.

Modes of Operation

Figure 3 shows the Settings area with Serial port mode selected.

Settings Serial	USB over ADB Operational
CO M Port	COM5
Baud Rate	921600 -
Timeout	1000 ms
Board Type	HDK •

Figure 3. Settings Area With Serial Port Selected

3.2 USB Over Android Debug Bridge (ADB) Mode

The USB over ADB mode provides a connection to the IC through the ADB on Android systems. This mode allows read and write of internal IC registers and firmware globals after the firmware is downloaded by the host processor.

To enter the USB over ADB mode using the WLAN SDIO interface in a processor shell window terminal, perform the following steps at the command prompt:

- 1. Type *adb root* and press Enter.
- 2. Type adb remount and press Enter.
- 3. Type adb shell and press Enter.
- To enable the bridge, in the adb shell enter:

asi /sys/kernel/debug/ieee80211/phy*/wlcore/mem &

The following message displays, identifying the adb device:

```
root@sdisl:/ # * daemon not running. starting it now on port 5038 *
* daemon started successfully *
List of services attached
command failed: Device or resource busy (-16)
```

Figure 4 shows the Settings area with USB over ADB mode selected and read and write registers.







3.3 Operational Mode

On Linux[®] platforms, the WLAN firmware is downloaded by the SDIO driver to the WiLink 8 device while in operational mode. RTTT operational mode provides a debug connection to the IC using the dedicated RS-232 interface to the read and write registers.

To enable debug capabilities, such as writing and reading registers and firmware globals, use the RTTT operational mode.

Figure 5 shows the Settings area with Operational mode selected.

Settings	Operational
COM Port	COM5 👻 🌮 TCP Port 1024
Baud Rate	921600 👻
Timeout	1000 ms
Board Type	HDK •

Figure 5. Settings Area With Operational Mode Selected

4 Connection and Firmware Download

The Connection tab connects the application to a target system-on-chip (SoC) and includes the connection group, which sets the correct port from the available host-PC serial ports as well as the appropriate baud rate (see Figure 6).

RT^3 (x0152374) VER: 1	2.0.0.55			100 C	
File View Tools To	oolBars Window	SubSet Help			
WLAN WL1273 WL12	283 WL18xx				
WLAN 18xx FW					
Connected with FW Channel Channel (Pirmary): 6 - 2437 MHz → Channel BW: ③ 20M ④ 40M Primary: Lower ↓ 5G	tenna Mode SO X Chain 1 Chain 2 X Chain 2 Chain 2 Chain 2 Hz Diversity	Settings Settings Serial COM Port Baud Rate 92 Timeout Board Type	Bx USB over ADB M32 IG00 Image: Second se	Disconnect Connectivity Status: MAC fw version : PHY fw version : TrioScope DLL Version: GUI Version: Board Info: Board Type:	 ✓ Poll Connection Connected 8.9.0.0.39 Rev 8.2.0.0.228 (FDSP: 1.162) 8.0.0.102 1.0.97 SP PG 2.2 PDI 2 183x or 180x
Power Mode (via MAC)	Ant 1 🔻	Files			
Current: Awake		Firmware file:	C:\Users\x0152374\Desktop\FW\8.5\wilink8-wlan-wl18x	x_fw\wl18xx-fw-4.bin	
Select: Listen 💌	Enter	INI file:	C:\Users\x0152374\Desktop\FW\8.5\WL1835MOD_INI	ini	
		TS DLL:	C:\Users\x0152374\Desktop\RTTT\Clients\TrioScope\1	8xx\ts18x.dll	Load
Read/Write (Hex)	(Jaw)				
Read Write Address (i Value (Hex) Register 1 0 PHY Start Bit End Bit 0 31 +	Hex) Type Calibration Calibration Status: I Bits	te Now	Conditions Temperature: Vbat: V	Status Current Operation Abort	Progress Remaining Time: 00:00:00 Progress: 0%
Update from script					





- To connect the RTTT application to the SoC, perform the following steps:
- 1. In the Settings area of the Connection tab, set the COM port and baud rate fields.

NOTE: The default baud rate is 921600 but can be updated to 3M.

- 2. In the Files area of the Connection tab, set the firmware and INI file from the git folder.
 - (a) Click the firmware and INI file path and browse to the location of the file, as shown in Figure 7.

Files		
Firmware file:	C:\Users\Desktop\FW\8.5\wilink8-wlan-wl1&ox_fw\wl1&oxfw-4.bin	 Load
INI file:	C:\Users\Desktop\FW\8.5\WL1835MOD_INI.ini	 Edit
TS DLL:	C:\Program Files (x86)\Texas Instruments\Wireless Tools\RTTT\Clients\TrioScope\1&x.dll -	 Load

Figure 7. Selecting the Firmware Files to Download

(b) Click Load. The RTTT application begins downloading the firmware files entered in the previous steps (see Figure 8).

310103	1000033
61%	×
Downloading Firmware to device	
You may cancel download by hitting	Cancel
Cancel	

Figure 8. Downloading Firmware Message

- 3. To select a channel, in the Channel area select the channel number/frequency from the Channel (Primary) list box.
- 4. To select the channel bandwidth, in the Channel area, click the 20M or 40M button. If the Channel BW is set to 40 MHz, the Primary list box becomes active. Select Upper or Lower channel. Figure 9 shows the packet types for Channel 7.

NOTE: Upper and lower selection is with respect to the primary channel.



Connection and Firmware Download





Figure 9. Packet Types for Channel 7

4.1 Register Reads and Writes

Figure 10 shows the Read/Write [Hex] area, used to select read and write registers.

Read/Write (Hex) Read Write Address (Hex)				
Value (Hex) Register Type				
0 PHY 🔽				
Start Bit End Bit 0 💽 31 💮 All Bits				
Update from script				

Figure 10. Read and Write Registers

4.2 Power Mode Menu

Figure 11 shows the Power Mode (via MAC) area, which contains the Select menu for the WLAN SoC. The Select menu lists the following power mode options:

- Awake mode (default)
- Listen mode

8

• Energy low power (ELP) mode

NOTE: TX can be set in awake mode only (for more information on TX, see Section 5, TX Tab).



Figure 11. Power Mode Menu

4.2.1 Awake Mode

In awake mode, MAC, PHY, and DRPw are fully active, and various RTTT functions are all active.

4.2.2 Listen Mode

In listen mode, MAC and PHY are awake on Beacon profile mode.

4.2.3 ELP Mode

In ELP mode, MAC, PHY, and DRPw are in shutdown mode. The WiLink SoC cannot receive or transmit packets.

To exit ELP mode, click the Exit ELP pop-up window that appears on mode entry.

While in ELP mode, the WiLink WLAN IP operates on slow clock only.

4.3 Antenna Mode Menu

Figure 12 shows the Antenna Mode area, used to select the antenna mode. MIMO and SISO antenna configurations are available at the 20-MHz bandwidth.

Antenna Mode
5150
TX Chain 1
Ochain 2
RX
Chain 1
Chain 2
5GHz Diversity
Ant 1 💌

Figure 12. Antenna Mode Area of the RT^3 Window

4.3.1 Supported Antenna Configuration

Table 1 describes the supported antenna mode configurations.

Antonna Modo	Т	X	RX		
Antenna wode	Chain 1	Chain 2	Chain 1	Chain 2	
5-GHz SISO	Х	A Band	Х	A Band	
2.4-GHz SISO	Х	BG2	Х	BG2	
2.4-GHz MIMO	BG1 + BG2	BG1 + BG2	BG1 + BG2	BG1 + BG2	

Table 1. Antenna Mode Supported Configuration



Connection and Firmware Download

RF_ANT1 is the main antenna for 2.4-GHz SISO and the default antenna for the 5 GHz on the WL1837 and WL1807 modules.

RF_ANT2 is a MIMO-only (MCS8 to MCS15) secondary antenna for 2.4-GHz MIMO operation and can be a diversity antenna for the 5 GHz on the WL1837 and WL1807 modules.

Figure 13 shows an example of the antenna connection that covers all antenna mode configurations.



Figure 13. TI Module WL1837 Block Diagram

4.3.2 5-GHz Diversity (WL1837MOD and WL1807MOD Only)

Antenna selection is controlled by the WLAN IP internal antenna diversity algorithm, based on the link quality of each antenna.

To test the mechanism:

- 1. After downloading the firmware, set the 5-GHz channel.
- 2. In the Antenna Mode area of the main working window, select Ant 1 or Ant 2 (see Figure 12) from the 5GHz Diversity drop-down menu.
- 3. Perform a channel tune calibration by setting the same channel number or selecting the 20M or 40M Channel BW button.

For example:

- 1. Select channel 5200 MHz.
- 2. Select Ant1 in the 5-GHz Diversity area.
- 3. Select channel 5200 MHz.

5 TX Tab

Figure 14 shows the WLAN 18xx FW TX tab.

Connection TX RX		
Packets	Overall Output Power	CLPC (Ext. FEM)
🔘 Single 🔘 Series 💿 Continuous		Enable CLPC Reset
Rate: MCS7 SGI Scramble	30.000	0 🔹
Preamble: Mixed Mode V Incr SeqNum	Analog Setting: 0 🔶 🔲 Lite Mode	Range CLPC [dB]
BW: 20M 40M Dual Str CCA Enable	Antenna: Auto	0 dB
Type: Data 💌 Seed 135 🛬		1 dB
Size: 100 🖨 Bytes Constant Data 124		2 dB
Amount: 1 🚖 Packets Duty Cycle: %		3 dB
		Tones
Delay: 220 🚔 µSec		Silence
Seurce MAC Address: 00:00:DE:DE:BE:BE		Carrier Feedthrough
Source MAC Address. GO.OD.D.E.D.E.D.E.	Start Tx Packet (Cont.)	Single Tone
Destination MAC Address: 12:34:56:78:90:AB		Bin Idx 0 🚔 Gain Idx 0 🚔

Figure 14. TX Tab Display

5.1 TX Packets Section

Table 2 describes the TX parameters.

Parameter	Description
	Single/Series: The number of packets to broadcast is set by the Amount parameter.
Mode	Continuous: Packets are broadcast continuously while transmission is ongoing (Start TX packet is pressed).
	802.11b: 1M and 2M DSSS, 5.5 and 11M CCK
Rate	802.11a/g: 6M, 9M, 12M, 18M, 24M, 36M, 48M, 54M OFDM
	802.11n: MCS0-15
Туре	Not used
Sizo	Minimum: 24 bytes
Size	Maximum: 4065 bytes
Amount	Available values: 1 to 10,000 packets
	Delay between packets:
Delay	Minimum: 220 µs
	Maximum: 1000000 µs
	Short/long: (802.11b rates, except 1M DSSS – only long Preamble allowed)
Preamble	OFDM (802.11a/g rates)
	Mixed-mode/Greenfield (802.11n rates)
SGI	SGI: Short guard interval (only for 11n)
	Checked: Short guard interval
	Unchecked: Long guard interval
Source/Destination MAC Address	Set as 6 bytes in format: xx:xx:xx:xx:xx



5.2 TX Tab Overall Output Power Area

The Overall Output Power area of the WLAN 18xx FW TX tab controls output power using a slider or a menu, allowing the desired power level to be set manually in dBm. To deliver maximum power to the antenna, select 30.000 dBm power and check the SoC Limits box.

To pass regulatory certification, additional power limitations are required on specific channels. To enable the limitations specified by the .INI file, click the Channel Limits box (for more information on power limits, see the <u>WL18xx INI File User Guide</u>.

Figure 15 shows the Overall Output Power area.

Overall Output Power				
● dBm				
30.000				
Analog Setting: 0 🗦 🔲 Lite Mode				
Antenna: 🗛 🔽 Channel Limits				

Figure 15. Overall Output Power Area

NOTE: Analog Setting, Antenna, dBPsat, and Lite Mode are for internal TI use only.

5.3 TX Tab Tones Area

Figure 16 shows the Tones area of the TX tab.

Tones
Silence
Carrier Feedthrough
Single Tone
Bin Idx 0 🚔 Gain Idx 0 🚔

Figure 16. TX Tones Area

To create and transmit the CW of a signal, select one of the following tone options and then click the Start TX Packet (Cont.) button on the TX tab:

- Silence: TX chain is ON and operational, but no signal is transmitted.
- Carrier Feedthrough: TX chain is ON and operational, and the LO is transmitted.
- Single Tone: TX chain is ON and operational, and a sinusoidal signal is transmitted with the following configuration options
 - Analog gain step
 - Offset from the carrier frequency (in OFDM bins)



5.4 TX Duty Cycle Configuration

Figure 17 shows the Type, Size, Amount, and Delay options (highlighted in red) used to set the duty cycle in the Packets area of the TX tab.

🎁 RT^3 (x0152374) VER: 2.0.0.55		and the second sec	
File View Tools ToolBars Window	SubSet Help		
WLAN WL1273 WL1283 WL18xx			
WLAN 18xx FW			
Connected with FW Channel Channel (Pirmary): 6 - 2437 MHz ↔ Channel BW: © 20M ○ 40M Primary: Lower ↓ Power Mode (via MAC) Current: Awake Select: Listen ♥ Enter Read/Write (Hex)	Connection TX RX Packets Single Series Continuous Rate: MCS3<	Overall Output Power dBm dBPsat SoC Limits 30.000 Analog Setting: Analog Setting: Channel Limits Start Tx Packet (Cont)	CLPC (Ext. FEM) Enable CLPC Reset Range CLPC [dB] 0 dB 1 dB 2 dB 3 dB Tones © Silence © Camier Feedthrough © Single Tone Bin Idx 0 s Gain Idx 0 s
Read Write Calibrati	on Conditions Temperature:	Status Current Operation:	Progress Remaining Time:
			00:00:00
Start Bit End Bit 0	Vbat:	Abort	Progress: 0%
Update from script			

Figure 17. Duty Cycle Control

For best TX performance, TI recommends setting the duty cycle of the device to less than 40% by selecting the correct packet length and delay time for a specific rate.

$$D.C[\%] = \frac{TxTime}{TxTime + Delay[\mu s]} = \frac{\frac{8 \times Size[Bytes]}{DataRate\left[\frac{bits}{s}\right]}}{\frac{8 \times Size[Bytes]}{DataRate\left[\frac{bits}{s}\right]} + Delay[\mu s]}$$
(1)

Based on Equation 1, Table 3 and Table 4 list calculated values for 30% DC at the most common rates.

Table 3. 20-MHz BW Rates

Rate	20-MHz BW			
	Size (Bytes)	Delay (μs)		
1DSSS	26	938		
11CCK	143	700		
54OFDM	1539	583		

Table 4. 20-MHz and 40-MHz BW Rates

Rate	20-MHz BW		40-MHz BW		
	Size (Bytes)	Delay (µs)	Size (Bytes)	Delay (µs)	
MCS0	218	705	429	700	
MCS7	1528	467	1365	280	
MCS15	1495	303	—	—	



TX Tab

5.5 Output Power Test on the WiLink 8 Device

The WiLink 8 device has an integrated power amplifier for the WLAN IP. The WiLink 8 device is characterized over PVT (process, voltage, temperature) to provide the maximum possible power to the antenna, while keeping the respective limits of the IEEE mask and EVM requirements.

Operational mode includes two possible output power levels:

- Maximum output power
- 8-dBm power (this mode is only set on the highest rate of the specific rate group 11b, 11g, or 11n), when the link is optimized for power consumption optimization.

The maximum output power is controlled by the device firmware. When setting the RTTT to maximum power in the slider, the power is automatically clipped to the maximum possible value that complies with IEEE requirement without user interference.

5.5.1 TX Testing Procedure

To test the output power on the WiLink 8 device, perform the following steps (see Figure 18):

- 1. In the Overall Output Power area, select dBm mode.
- 2. Click the SoC Limits box to enable the SoC limits option.
- 3. Using the slider, select a power setting of 30 dBm (see Figure 18).
- 4. In the Packets area, select the appropriate values from the Rate, Size, and Delay menus.
- 5. In the Channel area, set the channel to perform full RF calibration before TX.
- 6. To transmit, click the Start TX Packet (Cont.) button.

RT^3 (x0152374) VER: 2.0.0.55			
File View Tools ToolBars Window	v SubSet Help		
WLAN WL1273 WL1283 WL18xx			
WLAN 18xx FW			
Connected with FW	Connection TX RX		
Channel Antenna Mode	Packets	Overall Output Power	CLPC (Ext. FEM)
Channel (Pirmary):	🔘 Single 🔘 Series 💿 Continuous	◉ dBm ── dBPsat 🔽 SoC Limits	Enable CLPC Reset
6 - 2437 MHz 🚽 🔘 Chain 1	Rate: MCS3	30.000	
One of the second	Preamble: Mixed Mode STBC Incr Payload Incr Payload Incr SenNum	Analog Setting: 0 🚔 🔲 Lite Mode	Range CLPC [dB]
Primary: Chain 1	BW: 20M 40M Dual Str CCA Enable	Antenna: Auto	0 dB
Lower Chain 2	Type: Data 💌 Seed 135 💭		1 dB
5GHz Diversity	Size: 100 🖶 Bytes Constant Data 124		2 dB
Power Mode (via MAC)	Amount: 1 Packets Duty Cycle: %		Trans
Current: Awake	Delay: 220 JuSec		Silence
Select: Listen Enter			Carrier Feedthrough
	Source MAC Address: 00:00:DE:DE:BE:BE	Start Tx Packet (Cont.)	Single Tone
Read/Write (Hex)	Destination MAC Address: 12:34:56:78:90:AB		Bin Idx 0 🚔 Gain Idx 0 🚔
Read Write Calibra	tion Conditions	Status	Progress
Value (Hex) Register Type Ca	librate Now	Current Operation:	Remaining Time:
0 PHY Status	: Time:		DU:UU:UU
Start Bit End Bit 31 🔶 All Bits	Vbat:	Abort	
Update from script			

Figure 18. WLAN 18xx FW Tab

6 RX Tab

Figure 19 shows the RX tab.

Connection TX	RX				
Control Operational Mode Statistics Mode Reset Statistics Issue Ack 	de s	RX Statistics PER Total Good FCS Error MAC Mismatch		Polling (display update) Interval: 1500 💮 mSec	
		Total RSSI	0		
		RSSI at ANT	0	RX Mac Address	
				Rx Filter	
				Source MAC Address:	FF:FF:FF:FF:FF
				Destination MAC Address:	DE:AD:BE:EF:00:00

Figure 19. RX Tab

6.1 RX Statistics Area

The RX Statistics area displays the results of the received packet counters and the quantities of the packet types (good, FCS error, MAC mismatch) received since the last statistics reset as follows:

- Packet error rate (PER): Calculated by dividing the amount of error packets by the amount of total packets
- Total: If the Total box is unchecked, the total number of packets received by the WLAN firmware is displayed; if the Total box is checked, the user can enter the number of expected packets.

For example, if an external packet generator is set to transmit 1000 packets, enter the same number (1000) in this box. This value is used by the RTTT application to compute PER.

- Good: Displays the number of good packets received since the last statistics reset
- FCS error: Displays the number of FCS error packets received since the last statistics reset
- MAC mismatch: Displays the number of packets with a destination address mismatch that are then configured by the filter

If the Rx filter box in the RX Mac Address area is checked, the Rx MAC Address filter is enabled to drop all packets with different MAC addresses than configured. Using FF:FF:FF:FF:FF:FF:FF is equivalent to filter disabled.

6.2 Sensitivity Measurements

Sensitivity is measured by configuring the device to RX statistics mode, transmitting the data from ESG, and collecting the statistics from the device.

The sensitivity can be calculated using the statistics from the device (number of transmitted packets, number of received packets, and the number of good packets).

The default mode of the device is Operational mode, in which the device receives packets but does not gather statistics.

RX Tab



6.2.1 Sensitivity Testing Procedure

RX Tab

To measure sensitivity, perform the following steps:

- 1. In the Control area of the WLAN 18xx FW RX tab, configure the device to Operational Mode.
- 2. In the Channel area, select the channel.
- 3. In the Control area of the WLAN 18xx FW RX tab, configure the device to Statistics Mode.
- 4. To clear the statistics from the device, click the Reset Statistics button.
- 5. Transmit the packets burst from the ESG.
- 6. Read the results (statistics) from the device.

Figure 20 shows the WLAN 18xx FW RX tab.

WLAN 18xx FW				
Connected with FV/ Anterna Mode Channel (Pimrav) SI30 6 2437 NHz Channel SW: Chain 1 © 7/IM 4/IM Himay: Chain 2 Lowor Chain 2 Powor Mode tvo M/CO Soloci: Current: Image Soloci: Lation	Donnection TX 11X Control © Operational Mode © Statistice Mode Feest Statistice I kaue Aels	PK Statese PER I Iotal Good FCS Error MAC Mismatch Iotal HSSI RSSI & ANT	Poling (daplay uptare) Interval: 1500 🐨 mSec. RX Mac Address Rx File Source MAC Address Destination MAC Address.	FF:FF:FF:FF:FF:FF D1:A1:41:41:41:40
Read/Write (I lex) Address (Hex) Read/Write (I lex) Address (Hex) Value (Hox) Hogistor (ypc) 0 FHY Start Bit End Sr. 0 Start Sit Implate from script	Ibeton Calibrate Now atus: Time: Volat	na dur:: *C V	Sinh is Current Operation: Abort	Progress Remaining line: 00:00:00 Progress: 0%

Figure 20. RX GUI



Appendix A SWAU085E–July 2011–Revised September 2015

Terms and Abbreviations

Table 5 lists terms and abbreviations.

Term	Description
ADB	Android debug bridge
BD_ADDR	Bluetooth device address
BER	Bit error rate
BT	Bluetooth
BW	Bandwidth
CW	Carrier wave
DRPw	Digital radio processor (wideband)
ELP	Energy low power
FCS	Frame check sequence
HCI	Host controller interface
Host/host PC	A PC connected to the device through the serial port
LMP	Link manager protocol
LQM	Link quality monitor
MAC	Medium access control
MCU	Microcontroller unit
MIMO	Multiple input, multiple output
OSI	Open Systems Interconnection model
PER	Packet error rate
PHY	Physical layer of the OSI model
PVT	Process, voltage, temperature
RF	Radio frequency
RSSI	Received signal strength indication
RTTT	WLAN Real-Time Tuning Tool
SDIO	Secure digital input output
SGI	Short guard interval
SISO	Single input, single output
SW	Software
SoC	System-on-chip
VS	Vendor-specific



Page

Revision History

Changes from D Revision (January 2014) to E Revision

•	Changed organization of user's guide	1
•	Deleted Rev 0.1	1
•	Changed Section 1.1, System Requirements	3
•	Added Section 1.2, Configuration Requirements	3
•	Added Section 2, Installation	4
•	Changed Figure 2	4
•	Added Section 3, Modes of Operation	4
•	Deleted Drop Down Menus section	5
•	Changed Section 4, Connection and Firmware Download	6
•	Changed path of Rttt.exe in Section 4, Connection and Firmware Download	6
•	Changed Figure 6	6
•	Changed step 2 in Section 4, Connection and Firmware Download	7
•	Changed Figure 11	9
•	Changed Table 1	9
•	Changed RF_ANT2 range from MCS12 to MCS15 in Table 1	10
•	Changed Section 5, TX Tab	11
•	Deleted TX Dialog Box and RT3 Operation sections	11
•	Changed minimum delay from 20 µs and DSSS from 2M in Table 2	11
•	Changed Section 5.2, TX Tab Overall Output Power Area	12
•	Changed Figure 17	13
•	Changed Equation 1	13
•	Changed calculated values from 40% DC in Section 5.4, TX Duty Cycle Configuration	13
•	Changed Table 3	13
•	Changed Table 4	13
•	Changed Figure 18	14
•	Changed Section 6, RX Tab	15
•	Changed Figure 19	15
•	Changed Section 6.2, Sensitivity Measurements.	15
•	Changed Figure 20	16
•	Added Appendix A, Terms and Abbreviations	17

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